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Masami MIZUSHIMA*: On *Stellaria diversiflora*
Maxim. and its allies.

水 島 正 美*: サハハコベと其の一群について

A botanist wandering about lower mountains or hill-sides in Japan often meets with *Stellaria diversiflora* Maxim. or 'Sawa-hakobe' in spring, and from late summer to autumn he sometimes finds also *S. diandra* Maxim. or 'Tsuru-hakobe' even at the same locality. The both plants are so similar to each other that their classification has long puzzled Japanese taxonomists, and this question attracted the writer's attention to settle it.

In 1873 Maximowicz in his original description distinguished these two species as follows:

Petiolis breve villosa-ciliatis, pedunculis petiolo vix superantibus vel toto folio plus duplo logioribus, petalis bifidis mox sepala superantibus mox calyce triplo brevioribus, staminibus 10, calycem aequantibus, filamentis basi obsoletissime villosulis.

..... *S. diversiflora* Maxim.

Petiolis glabris pedunculiis foliis brevioribus glabris, petalis minutissimis integris vel leviter emarginatis, staminibus 2 calyce dimidio brevioribus ad basin filamenti dense barbatis.

..... *S. diandra* Maxim.

Since then taxonomists have generally distinguished the both by the hairness of petioles, the number of stamens or the relative length between the peduncles and leaves. The attempt to recognize the two species by these characters mentioned above seems to be difficult and artificial for the writer.

To solve this question the writer collected some individuals of *S. diversiflora* Maxim. from Mt. Takao, prov. Musashi, and transplanted them to

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his garden in Tokyo, then he has cultivated and observed them for two years from June 1948 to May 1950.

The living plants collected by the writer from the above mentioned locality had flowers with 7—10 stamens, but they produced flowers with 2 stamens in the next autumn, and then in the following spring flowers with 8—10 stamens reappeared. The flowers with two stamens of our plant differ



Fig. 1. Whole plant in late autumn; from Mt. Takao, prov. Musashi (ca. 2/3).

from those of Maximowicz's *S. diandra*, judging from his description, in having sometimes not glabrous peduncles and petioles, and not entire or slightly emarginate petals but bilobate ones. These differences, however, are not so fundamental, and the hairiness of the apex of peduncles and the base of petioles varies even in one and the same individual, and the shape of the tip of petals varies too. It has been proved from the critical study of the living materials and all dried specimens available that the relative length between the peduncles and the leaves or between the sepals and petals, and the hairiness of the filaments also vary by individuals or even in the same individual during the flowering season. The hairiness of the

petals also varies by individuals or even in the same one with the season. When the material is depauperate or very small and gracile, the base of the petals is sometimes glabrous. Specimens from the isl. Yakushima and Mt. Hōnokawa, prov. Tosa, Shikoku are very gracile in appearance, but they have barbate-ciliate petals except one sheet from the latter locality. It is still a good distinguishing character of this species that petals are sparingly barbate-ciliate during its flowering season at least in spring, though Maximowicz and others did not mention about it, and young leaves, at least, are always patent hairy above.

Thus it is clear, he believes, that both *S. diandra* and *S. diversiflora* are neither distinct species nor varieties, and are not only one and the same species but also the two different phases of its life history or seasonal forms of the same plant. The correct scientific name of this plant is *S. diversiflora* Maximowicz, and *S. diandra* Maxim. becomes its synonym.

The species under consideration is distributed northwards to prov. Mutsu, the northernmost county of Honshu and spread all over the mainland of Honshu, Shikoku and Kyushu including Tsushima and Yakushima. In these districts some geographical forms seem to be recognized, and the northern form and the southern form are, as a whole, fairly well differentiated. The former is robust and is confined to the mountainous parts of middle and northern Honshu rather on the side of Japan Sea (Hokuriku and Tōhoku districts mainly) like that of *Viburnum plicatum* var. *glabrum*, and the latter is very gracile and restricted to the isl. Yakushima (*S. diandra* var. *yakumontana* Masamune) and the southern part of prov. Osumi, the mainland of Kyushu.

The variation of the shape of the leaves also correlates slightly with geographical distribution. The one extreme shape of leaves is ovate-deltoid (the length of the lamina is nearly equal to the width), and the form with such leaves is spread over Kwanto district with no exception in the writer's knowledge and southwards to Kyushu mainly on the side of the Pacific Ocean with an intermediate shape between the next. The other extreme shape is oval- or oblong-lanceolate (the length of the lamina is as about 1.5-2.5 times long as the width), and this form extends its area from Kinki district southwards to Chugoku district, Shikoku and Kyushu, northwards on the other hand to Dewa-Hokuriku district with interconne-

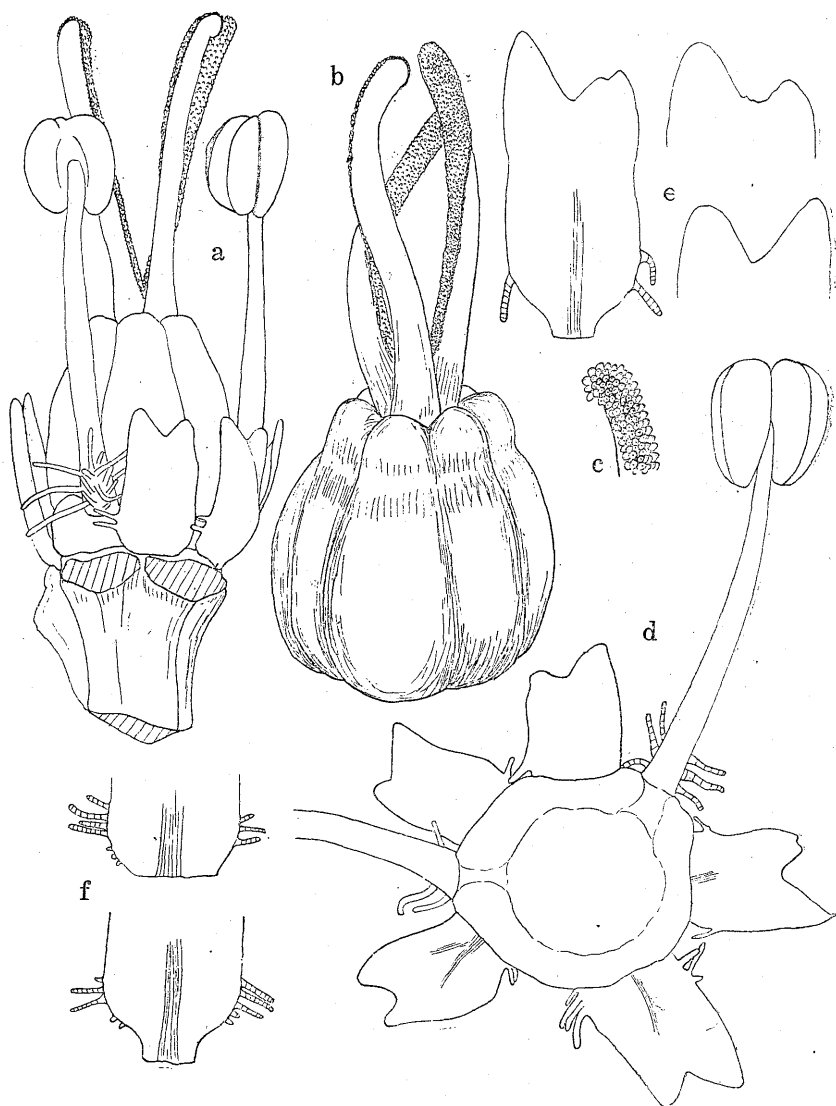


Fig. 2. a. Flower (sepals removed) (ca. $\times 20$). b. Pistil (ca. $\times 35$). c. Apical part of style showing stigma. d. Petals, stamens and disc seen from the upper (ca. $\times 25$). e. Petals and their tops (ca. $\times 40$). f. Basal parts of petals (ca. $\times 40$).

cting forms alike the former. But in Chugoku district the shape of the lamina is, so far as the writer knows, narrower and comparatively uniform.

The form with intermediate shapes of the lamina distributes all over the area except Kwanto and Chugoku districts.

S. diversiflora Maxim. grows vertically from the evergreen broad-leaved forest zone in the lowermost part of Honshu to the upper part of the deciduous one or to about 1300m above the sea, and on humid gravels or thick humus in the forest.

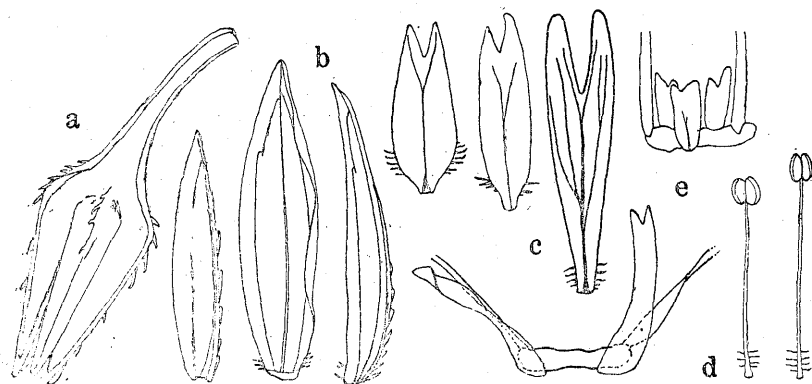


Fig. 3. a. Cleistogamic flower. b. Sepals seen from the lateral and ventral sides (center). c. Petals. d. Stamens (inner, the left, and outer, the right). e. Relative situation of petals and stamens (all ca. $\times 7$).

When the writer directed his attention to Formosan congeners, he found that *S. arisanensis* Hayata (= *Cerastium arisanense* Hayata) is a Formosan representative of *S. diversiflora*. Hayata's species is distinguishable therefrom in having relatively large flowers with petals constantly longer than sepals. It grows at the altitude of about 1500m above the sea level, ie. near the upper part of the evergreen broad leaved forest zone with scattered conifers and by the rather humid but sunny pass in the forest, according to Dr. Tagawa, and seems to be distributed in the whole central mountain range of the island. The hairness of the leaves, petals and stamens are quite similar to Maximowicz's species. Though all specimens examined by the writer had no mature capsule, they can be considered as conspecific with *S. diversiflora* Maxim., like *Adenophora morrisonensis* Hayata is the same as *A. nikoensis* Fr. et Sav. in a wider sense.

It is noteworthy that Franchet reported a variety of this species (*S. diversiflora* var. *gymnandra*) from prov. Shensi, China based on the David's

collection. His variety resembles in general to our species with the exception of having 2-parted and almost mature seeds with not granulate but smooth lateral side. The latter point, however, is not rarely observed in the Japanese plants when the seeds are not in full maturity and even in the same capsule. Franchet, who is not acquainted with fertile specimens of *S. diversiflora*, stated that his variety is similar to Maximowicz's Japanese species as a whole, but differs from it only in having quite glabrous filaments of the stamens. As the habitat of the Shensi plant is the cultivated ground, this Chinese plant may doubtfully be a different species from ours. The typical Japanese plant is never seen in such a place.

Although the Chinese representative of the species is still uncertain to the writer, he is of opinion that *S. diversiflora* Maxim. in a wide sense seems to be one of the Sino-Himalayan elements. It may be concluded from the phytogeographical standpoint that this species was an old continental origin and migrated eastwards to Formosa then north-eastwards to Japan through the Louchoo islands, and has not reached Hokkaido nor Corea. If it is true, *S. arisanensis* is the mother species, and *S. diversiflora* which is the nomenclatorial type should be considered as a derivative from *S. arisanensis*.

During the course of his work, the writer wishes to tender his cordial thanks to Dr. Hara for his valuable and kind guidance, and also he desires to express his warm gratitude to Professor Kitamura and Dr. Tagawa in the University of Kyoto and to Dr. Satake in the National Science Museum, Tokyo who kindly permitted him to investigate specimens in their herbaria.

Stellaria diversiflora Maximowicz in Bull. Acad. St.-Pét 18: 379 (1873) in adnota sub *S. diandra*. —Fr. et Sav., Enum. Pl. Jap. 2: 296 (1877)—Matsum., Ind. Pl. Jap. 2 (2): 296 (1912). *S. diandra* Maximowicz, l. c. 379 (1873)—Fr. et Sav., l. c. 296 (1877)—Matsum., l. c. (1912). ? *S. diversiflora* var. *gymnandra* Franchet, Pl. David. 1: 52 (1884). *S. diversiflora* var. *diandra* Maximowicz in litt. ex Makino in Bot. Mag. Tokyo 10: (108) (1896).

Foliis supra pilis patentibus sparse obtectis, sed demum denudatis pilloso-scaberrulis; sepalis dorso acute carinatis vulgo prope basin antrorsim strigoso-pilosis; petalis apice bilobatis versus basin barbato-ciliatis; staminibus saepe 7-10, antheris albis, filamentis dorso basin villosa-barbatis bene recognoscenda.

var. diversiflora.

Herba perennis. Caulis primo ascendens et demum longe elongatus reptans saepe ad nodos radices fibrillosos paucos emittens, tetragularis oppositè bicarinatus glaberrimus, intense viridis, ca. 1-2.5mm crassus in sicco. Folia omnia distincte petiolata, deltoideo-ovata—cordata, ovato-oblonga vel subrhomboidea raro lanceolato-oblonga, juvenilia saepe depresso-deltoidea vel subreniformia, petiolis supra canaliculatis certe ad basin ciliatis vel interdum glabris, laminis supra intense viridibus patentè pilosis mox decalvatis subtus pallidis glabris raro supra costas pilosis apice apiculatis basi breviter cuneatim in petiolum attenuatis, nervis intra marginalibus utrinque costis distincte et nervis primariis tantum visibilibus in vivo, 5-60mm longis 3-30mm latis. Flores axillares solitarii; pedunculis folio brevioribus longioribusve, praeter apicem bicarinatum hirtum vel scaberulum glabris; calyce basi infundibulare, sepalis 5, subulato- vel mere lanceolatis vulgo 3-nervosis, nervis infra apicem conniventibus sed non raro lateralibus obsoletis evanidis, apicem versus acuminato-obtusis, dorso acute carinatis saepe infra medium antrorsim strigoso-hirtis vel scaberulis, margine albo-scariosis basi barbellatis vel glabris, 3-5-7mm longis 1-1.5-(2) mm latis; petalis (0)-5, albis vulgo sepalo brevioribus, lineari-cuneatis, oblanceolatis vel oblongis apice emarginatis vel inaequaliter ad 1/3 bifidis raro integris, basi saepe obsolete unguiculatis et ad marginem parce barbatis, 0.8-7mm longis; discis lacteis staminiferis; staminibus 10-2, calyce vix brevioribus vel fere eum aequantibus, filamentis dorso basin saepissime villosa-barbatis rarius glabris papillosisve, antheris albis; ovario ovato, albo vel viridi-albo 3-carpellato, infra apicem leviter constricto; stylis 3-(4), ovario ca. sesquipedio longioribus, apice recurvis, intra faciem mammoso-stigmatibus. Capsulae globosae subhexagonae calycem aequantes vel breviores, aequaliter valvato-6-fidae; seminibus vix compressis ovalibus, ellipticis vel reniformibus, brunneis vel fuscis dense tuberculatis, 1-1.5-2mm longis 1-1.5mm latis.

Nom. Jap. Sawa-hakobe (Matsumura 1886), Tsuru-hakobe (Matsumura 1886), Iwawaki-hakobe (Yoshino 1935).

forma **robusta** Mizushima, f. nov. A typo robustiore, caule in sicco 1.5-2.5mm crasso differt.

Nom. Jap. O-sawahakobe (Makino).

Typus. Honshu. Prov. Uzen: in monte Haguresan (F. Maekawa et H. Hara, Jun. 12, 1937 in Herb. Univ. Tokyo).

forma *angustifolia* Mizushima, f. nov. Folia ovalia vel oblongo-lanceolata, apicē elongato acuminata, longitudine latitudinem 1.5-2.5-plo longa.

Nom. Jap. Nagaba-sawa-hakobe (nom. nov.).

Typus, Shikoku. Prov. Iyo: Onigajō (T. Nakai, Jun. 1926).

forma *yakumontana* (Masamune) Mizushima, comb. nov.

S. arisanensis Hayata sensu Masamune, Prel. Rep. Veg. Yakusima 73 (1929). *S. diandra* var. *yakumontana* Masam., Fl. Geobot. Yakusima 185(1934).

Tota planta pergracilis, alio modo ut in typico. Caulis in sicco ca. 0.8 mm crassus vel angustior. Folia 5-8mm longa 3-7mm lata. Flores minores, sepalis 3-4-6mm longis 1-1.5mm latis, petalis 1.5-3.5mm longis, antheris primo purpurascens (fide Sugimoto 1928).

Nom. Jap. Yakushima-hakobe (Sugimoto 1928), Yakushima-sawa-hakobe (Masamune 1934).

var. *leptophylla* (Hayata) Mizushima, comb. nov.

Cerastium arisanense Hayata, Mat. Fl. Formosa 35 (1911); Icon. Pl. Formosa. 1: 69 (1911). *Stellaria arisanensis* (Hayata) Hayata, Icon. Pl. Formosa. 3: 40(1913). *S. arisanensis* var. *leptophylla* Hayata, l. c. 3: 40 (1913).

Haec varietas quam typicam gracilior sed flores pro ratione majores. Specimina a me examinata foliis 4-9-(25) mm longis 4-9-(17) mm latis et saepe longitudine aequilatis, sepalis (4)-6-8mm longis, petalis (4.5)-8-12mm longis semper calyce longioribus.

Nom. Jap. Arisan-hakobe (Hayata 1917), Oba-arisan-hakobe (Hayata 1917).

Maximowicz が記載した *Stellaria diversiflora* (サハハコベ) と *S. diandra* (ツルハコベ) とは頗る類似した植物で、往々同一場所に於てさへも見出され、記録されている。従来兩者を識別するのに葉と花梗との長さの比、雄蕊の數、葉柄基部に於ける鬚毛の有無等の特徴に依つて來た。然し筆者が栽培した材料は春にはサハハコベ型の花を開き、初夏より秋にかけてはツルハコベ型の花を同一株上に着けた。中秋を過ぎるとそれ以前より出し始めて居た閉鎖花がずつと小形になり、M氏の記載に吻合する如き形のものも見られた。此の觀察に伴せて東大、京大及び國立科學博物館所藏の標本を檢した結果、サハハコベとツルハコベとは同一種であるのみならず兩名は單に春秋の2型に對して夫々命ぜられたものに過ぎぬことを確信するに至つた。

サハハコベは本州一圓、四國、九州(屋久島を含む)に分布するが、形態的に多少の地方色が見られる。即ち北陸より東北地方の日本海側深雪地域には全體大形の一形を産し、關東地方では葉の長さとの幅の略々等しい型となり、近畿及び中國地方、四國、九州にかけては葉に長味のある形として表現される。屋久島では九州南端地方産品と共に著しく纖弱である。尙臺灣産のアリサンハコベと其の變種として記されたオホバアリサンハコベとは花が比較的に大きく、花瓣が常に萼を超える點以外にサハハコベと差がないので同種中の變異と考へる。サハハコベ群は邦産の他種に比して少くとも莖頂附近の葉には常に粗毛を散生する點で容易に區別出来る。